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(54) Abstract Title
Software portable telephone set

(57) The transmitting and receiving circuits of a telephone are reconfigured afresh via software updates on
the basis of the mounting of a detachable transmitting apparatus. Received signal input from an antenna may
be fed via a received signal mixer, 2, and an A/D converter, 3, to a demodulator, 4. On the transmission side, a
signal may be input to a modulator, 10, through a route converse to that of the received signal, for analog
output. The updating software may be downloaded from a program memory, 6 and may further be capable of
signal conversion processing and act according to a system switching command. A wide-band synthesizer
may be included. The detachable module may include an amplifier, filter and isolator. The transmission
modules may operate at different frequencies. The currently operating system may be detected on the basis of
the demodulated output of the received signal and then displayed.
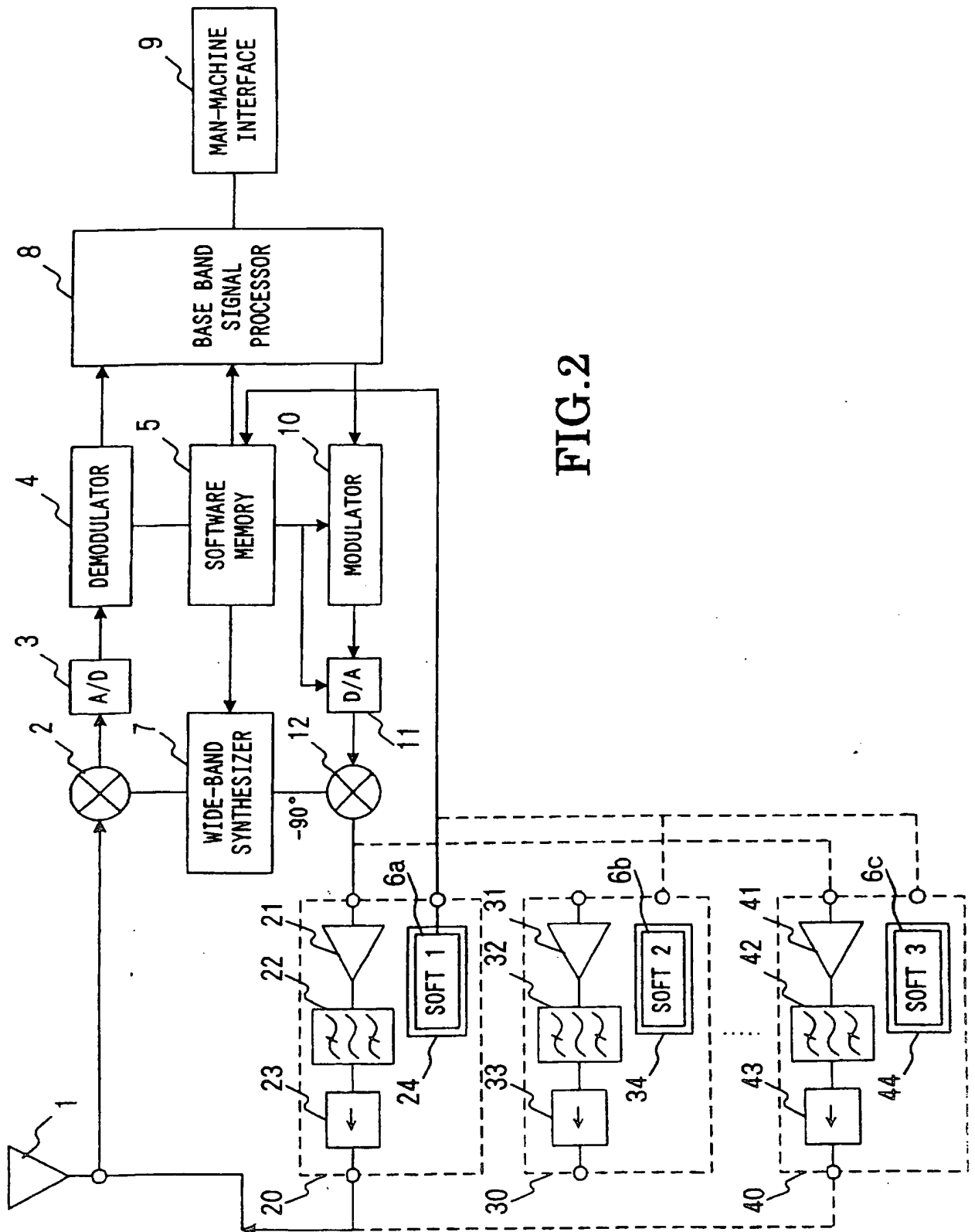
FIG.1

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FIG. 1

FIG.2

FIG.3

FIG.4

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        ┌─────────────────────────┐
        │ PORTABLE TELEPHONE SET  │
        │       POWER ON          │
        └─────────────────────────┘
 n=1~n              │
   ┌────────────────▼────────────┐
   │   ┌─────────────────────────┐
   │   │   DOWNLOAD SOFT WARE n   │
   │   └─────────────────────────┘
   │                │
   │                ▼
   │         ◇ DEMODULATOR OUTPUT? ◇──── PRESENCE
   │                │                        │
   │              NONE                       ▼
   │                │         ┌─────────────────────────────┐
   │                │         │   OUTPUT DISPLAY OPERATION   │
   │                │         │      SIGNAL OF SYSTEM n      │
   │                │         └─────────────────────────────┘
   │                │                        │
   └────────────────┼────────────────────────┘
                    ▼
             ┌─────────────┐
             │     END     │
             └─────────────┘
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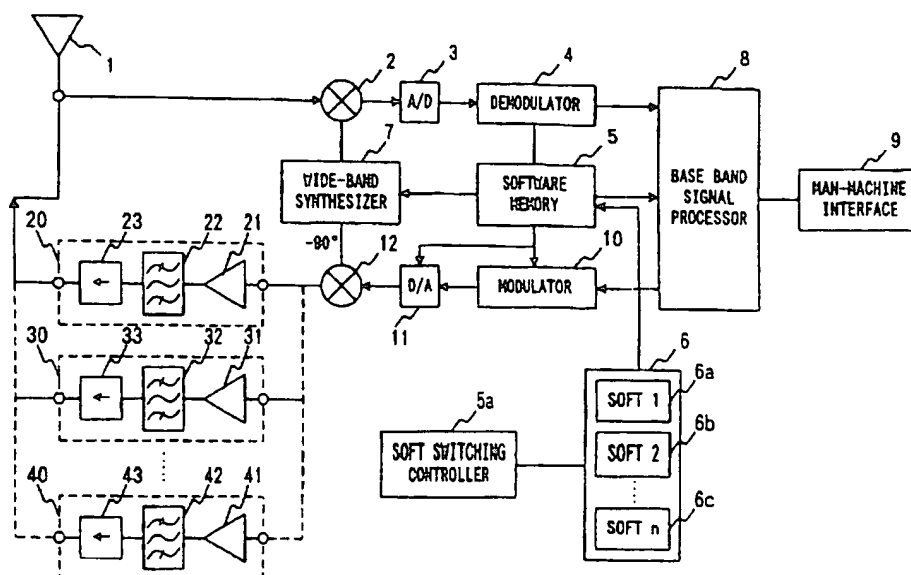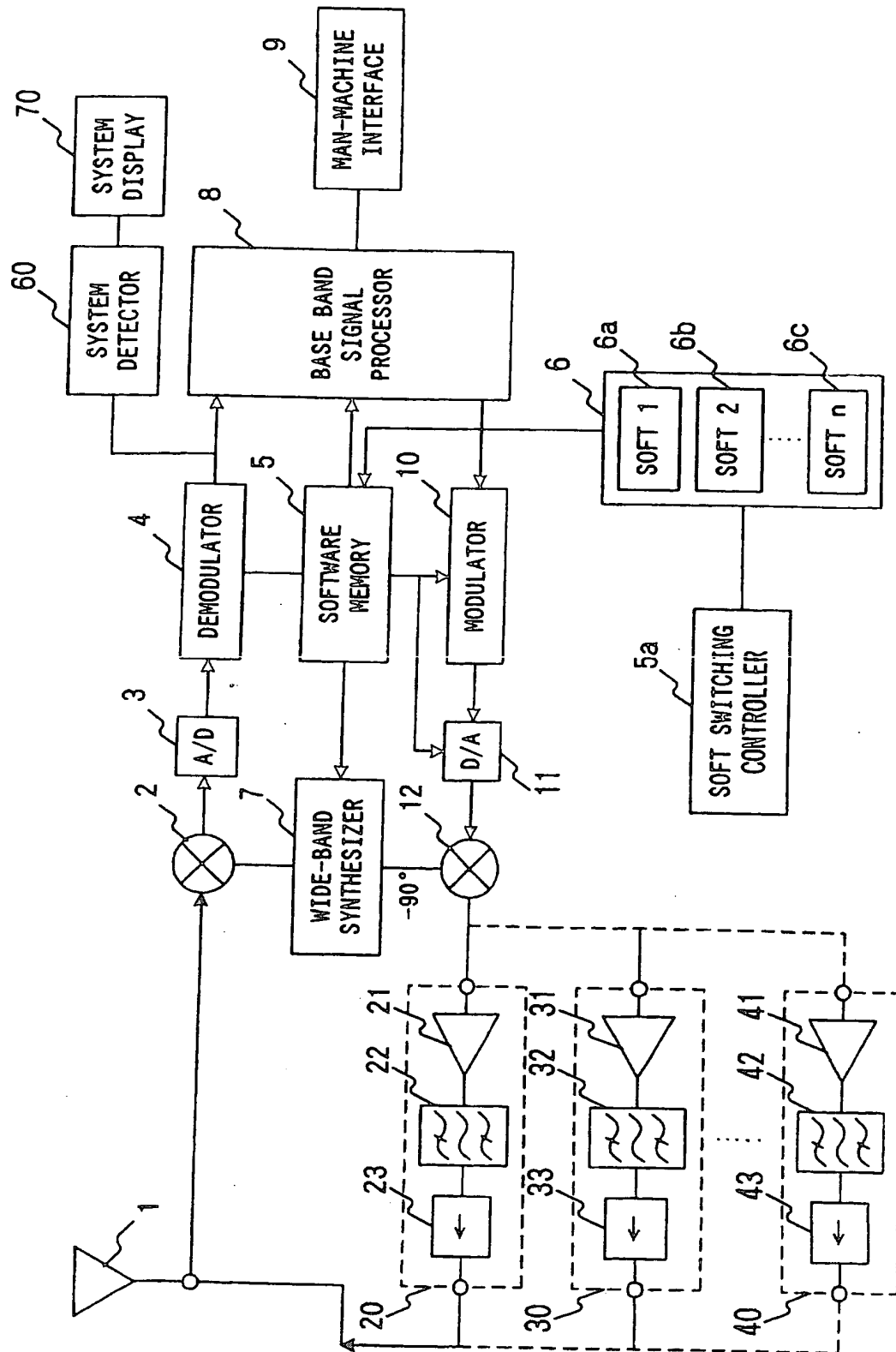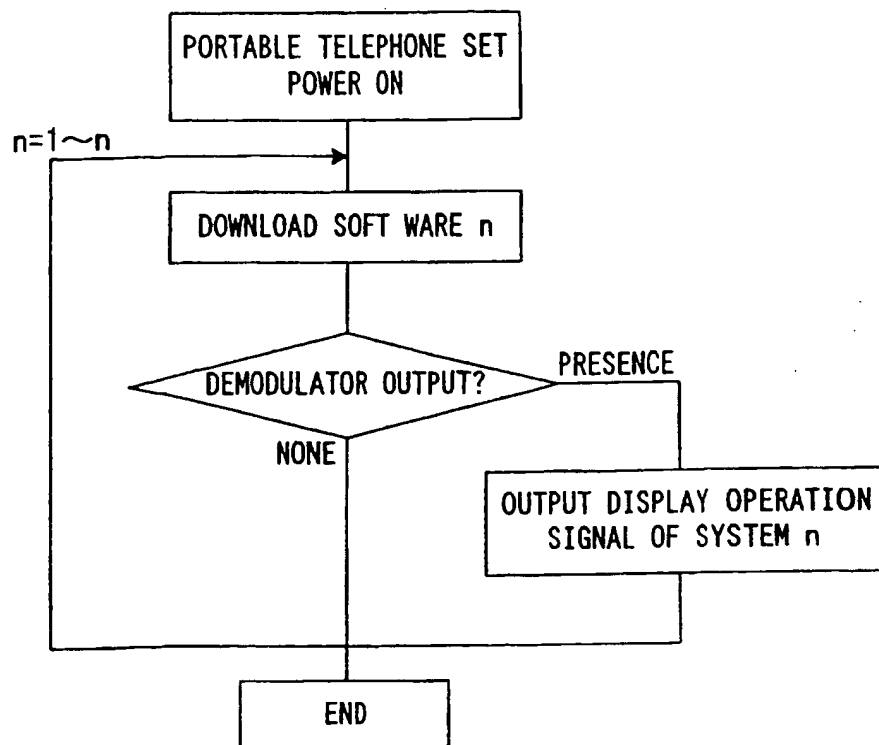
SOFTWARE PORTABLE TELEPHONE SET

BACKGROUND OF THE INVENTION

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The present invention relates to a software portable telephone set and, more particularly, to a software portable telephone set capable of coping with a plurality of different radio systems with the same basic structure by means of reconfiguring software and mounting different hardware modules for each system.

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In a software radio unit, signals which are received and to be transmitted are converted in an A/D and D/A converters from analog to digital signal and vice versa, respectively, so that digital signal processing is performed as much as possible in the radio unit. Digital signal processing is performed according to a

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software program. This means that the content or function of the signal processing can be changed by replacing the software. It is thus possible to readily cope with a plurality of different radio systems with the same hardware structure by changing programs.

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However, when it is intended to apply such software radio techniques to portable telephone sets, the following problem is encountered. To be able to cope with a plurality of different systems, wide-band active and passive components are necessary. Usually,

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expanding the frequency-band coverage of components results in characteristics deterioration. In particular, deterioration of the transmission-side characteristics due to a frequency-band coverage increase directly

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influences the performance of the portable telephone set, and this is a great barrier in the realization of software portable telephone sets.

The above software radio techniques required wide-band passive and active components to be able to cope with a plurality of different systems. Usually, the characteristics of the active and passive components deteriorate with a frequency-band coverage increase. In particular, it is really difficult to maintain high efficiency of a transmitting power amplifier, which is one of the main functional components of the trans-mitting-side part, over a wide frequency band. It is also really difficult to increase, with low loss, the frequency-band coverage of transmission signal filters and isolators. Deterioration of characteristics of the transmission-side components poses problems in the portable telephone set that reduces time of use and increases the size of the portable telephone set body; this greatly reduces the commercial value of the soft-ware portable telephone set.

SUMMARY OF THE INVENTION

The present invention is for solving the above drawback, and an object of the preferred embodiment is to provide a software portable telephone set having resort to reconfigurable circuit techniques to cope with a plurality of different systems while holding the same hardware structure. It permits, with a detachable trans-mitting function, the selection of a best-performance

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power amplifier and other components for each system, so that it is suited for frequency-band coverage increase.

According to an aspect of the present invention, there is provided a software portable telephone set

5 comprising a detachable transmitting function and transmitting and receiving circuits capable of being reconfigured afresh with software updating, wherein the transmission system is reconfigured afresh in relation to the mounting and demounting of a transmitting function

10 part. According to the above invention, it is possible to provide a transmission part suitable to each system. Further, wide-range bandwidth transmission and reception operations are possible by coping with a plurality of systems with the same hardware

15 construction.

The transmitting function is provided by a detachable module for transmitting a modulator output analog signal. According to this, it is possible to select an optimum module for each system to realize an

20 optimum transmission without degrading the characteristic of the transmission parts.

The transmitting and receiving circuits have a software memory part for executing signal conversion processing, programs transferred from a program memory

25 being set in the software memory part. According to this, it is possible to easily cope with a plurality of systems with the same construction.

The transmitting and receiving circuits include a

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demodulator, a modulator and wide-band synthesizer which are controlled by a program stored in the software memory part. According to this, it is possible to cope with a plurality of systems with the same construction by controlling the demodulator, modulator and wide-band synthesizer with a program corresponding to each system.

The detachable module includes a power amplifier, a transmission signal filter and an isolator. According to this, it is possible to select an optimum module for each system, thus preventing the degradation of the characteristic of the power amplifier, transmission signal filter and isolator. Further, since the character deterioration does not result, the characteristic with low loss can be maintained, and the deterioration of the parts is prevented.

The transmitting and receiving circuits have a software memory part for executing signal conversion processing, programs transferred from a program memory are set in the software memory part, and a plurality of programs for commanding signal conversion processing are stored in the program memory. According to this, it is possible to cope with a plurality of systems by storing a plurality of programs, and to cope with service in districts corresponding to the movement of the portable telephone set.

The transmitting and receiving circuits have a software memory part for executing signal conversion

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processing, programs transferred from a program memory are set in the software memory part, and the software memory provides commands according to a program transferred from the software source memory according

5   to a system switching command. According to this, it is possible to cope with each system by the program command.

According to an aspect of the present invention, there is provided a portable telephone set comprising a transmission function unit and/or a receipt function

10   unit, wherein the transmission function unit for performing a specified transmission process is detachably mounted to a body of the portable telephone set and the operation of the transmission function and/or receipt function is determined on the basis of selection

15   of predetermined software.

The predetermined software is selected from a plurality of softwares stored in a memory in the portable telephone set.

The operation of a received signal mixing portion,

20   a demodulating portion and a base band signal processing portion in the receipt function unit is determined on the basis of the predetermined software.

One of a plurality of transmission function units each performing a different frequency band operation is

25   detachably mounted to the body.

The plurality of softwares are stored in a software source memory, one of the plurality of softwares is selected and down-loaded and the operation of the receipt

processing unit is defined by the downloaded software.

The transmission function unit includes an amplifier, a transmission signal filter and an isolator.

5   The transmission function unit includes a software memory for storing a plurality of softwares each adapted to each transmission function unit; the predetermined software is defined by loading the software from the software memory in the mounted transmission function unit.

10   The currently-operating system is detected on the basis of demodulated output of the received signal in the receipt function unit, and the detected system is displayed.

BRIEF DESCRIPTION OF THE DRAWINGS

15   Preferred features of the present invention will now be described by way of example only, with reference to the accompanying drawings, in which:-

Fig. 1 is a block diagram showing a first embodiment of the present invention;

20   Fig. 2 is a block diagram showing a second embodiment of the present invention;

Fig. 3 is a block diagram showing a third embodiment of the present invention; and,

Fig. 4 is a flowchart illustrating the operation of the system detector unit.

25   the system detector unit.

PREFERRED EMBODIMENTS OF THE INVENTION

Preferred embodiments of the present invention will now be described with reference to the drawings.

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The embodiment to be described is merely an example of the software portable telephone set according to the present invention.

5   As shown in Fig. 1, in the software portable telephone set according to the present invention a received signal inputted from an antenna 1 is fed through a received signal mixer 2 and an A/D converter 3 to a
10 demodulator 4. The demodulator 4 is operated according to software down-loaded in a software memory 5. The function of the demodulator 4 can be reconfigured afresh with every software updating.

The down-loaded software is preliminarily stored
15 in a software source memory 6 which is programmed for each system. In other words, a plurality of software entities are stored in the software source memory 6, and one of them is selected and down-loaded in the memory 5 by a software switching controller 5a. The received
20 signal mixer 2 receives a local oscillation signal fed from a wide-band synthesizer 7,with the frequency thereof restricted according to the software. As a result of the demodulation, a digital signal is fed to a baseband signal processor 8 for signal processing, and then fed out
25 through a man-machine interface 9 to the outside. The base-band signal processor 9 can be reconfigured afresh according to the software. On the transmission side, voice or like signal is inputted,along a route converse

to that of the received signal to a modulator 10. The
modulator 10, like the reception side, can be
reconfigured afresh for each system according to
software.

5   The modulator output is fed to a D/A converter 11
for conversion to an analog signal. The analog signal
is fed to a transmission signal mixer 12 for conversion
to a carrier frequency, and then fed to a module 20, which
includes a power amplifier 21, a transmission signal

10   filter 22 and an isolator 23, to be sent out via the
antenna 1. A plurality of modules (20, 30 and 40) are
prepared for each system, such as frequency band, and
used detachably. Since the modules are detachable, it
is possible to select best module components, such as a

15   power amplifier, for each system. It is thus possible
to avoid characteristic deterioration due to frequency-
band increase.

       Fig. 2 is a block diagram showing a second
embodiment of the present invention. This embodiment is

20   the same as the previous first embodiment except that
the modules 20, 30 and 40 include respective program
memories 24, 34 and 44, in which software for
corresponding systems is stored. When a module is
mounted, the software thereof is down-loaded in the

25   software memory 5. In this embodiment, the software
source memory 6 in the previous first embodiment can be
dispensed with, which is desired for reducing the price
and size of portable telephone sets.

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Fig. 3 is a block diagram showing a third embodiment of the present invention. This embodiment is the same as the previous first embodiment except that a system detector unit 60 and a system display unit 70 are provided on the transmission side. Fig. 4 is a flow chart illustrating the operation of the system detector unit 60. In Fig. 4, the power of portable telephone set is "on", then a software n (n=1 to n) from a software memory 6 is down-loaded (step S1). Next, the system detector 60 checks whether the output of demodulator exists or not (step S2). When no demodulator output is checked the routine is ended. When the demodulator output exists, a display signal for displaying the system n is generated (step S3) and the routine is ended.

From a display obtained as a result of detection, the user can know systems which can be presently used. Thus, a module complying with the display may be selected and mounted. Thus, even in an unfamiliar land or the like, a system offering services can be known, and communication can be readily set.

As has been described in the foregoing, with the software portable telephone set according to the present invention, it is possible to avoid characteristic deterioration of transmission side components with a detachable transmitting function; also, transmitting and receiving circuits which are capable of being recon-figured permit coping with a plurality of systems with the same hardware structure. It is thus possible to

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provide a software portable telephone set, which is suited for frequency-band coverage increase.

Changes in construction will occur to those skilled in the art, and various modifications and embodiments

5   may be made without departing from the scope of the present invention. The matter set forth in the foregoing description and accompanying drawings is offered by way of illustration only. It is therefore intended that the foregoing description be regarded as illustra-

10   tive rather than limiting.

Each feature disclosed in this specification (which term includes the claims) and/or shown in the drawings may be incorporated in the invention independently of other disclosed and/or illustrated features.

15   The text of the abstract filed herewith is repeated here as part of the specification.

Received signal input from an antenna is fed via a received signal mixer and an A/D converter to a demodulator. The demodulator is operated according to soft-

20   ware downloaded in a software memory from a program memory. A demodulator output digital signal is fed to a base-band signal processor for signal processing, and then fed out through a man-machine interface to the outside. On the transmission side, a signal to be

25   transmitted is input to a modulator through a route converse to that of the received signal. The modulator output is fed to a D/A converter for conversion to an analog signal, which is in turn fed to a transmission

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signal mixer for conversion to a carrier frequency, and then fed to a module, which includes a power amplifier, a transmission signal filter and an isolator, to be transmitted via the antenna.

What is claimed is:

1. A software portable telephone set comprising a detachable transmitting function part and transmitting and receiving circuits capable of being reconfigured afresh with software updating, wherein the transmission system is reconfigured afresh in relation to the mounting and demounting of the transmitting function part.

2. The software portable telephone set according to claim 1, wherein the transmitting function is provided by a detachable module for transmitting a modulator output analog signal.

3. The software portable telephone set according to claim 1, wherein the transmitting and receiving circuits have a software memory part for executing signal conversion processing, programs transferred from a program memory being set in the software memory part.

4. The software portable telephone set according to claim 1, wherein the transmitting and receiving circuits include a demodulator, a modulator and wide-band synthesizer which are controlled by a program stored in the software memory part.

5. The software portable telephone set according to claim 1, wherein the detachable module includes a power amplifier, a transmission signal filter and an isolator.

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6. The software portable telephone set according to claim 1, wherein the transmitting and receiving circuits have a software memory part for executing signal conversion processing, programs transferred from a program memory being set in the software memory part and a plurality of programs for commanding signal conversion processing being stored in the program memory.

7. The software portable telephone set according to claim 1, wherein the transmitting and receiving circuits have a software memory part for executing signal conversion processing, programs transferred from a program memory being set in the software memory part and the software memory providing commands according to a program transferred from the software source memory according to a system switching command.

8. A portable telephone set comprising a transmission function unit and/or a receipt function unit, wherein the transmission function unit for performing a specified transmission process is detachably mounted to a body of the portable telephone set and the operation of the transmission function and/or receipt function is determined on the basis of a predetermined selection of software.

9. The portable telephone set according to claim

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8, wherein the predetermined software is selected from a plurality of softwares stored in a memory in the portable telephone set.

10. The portable telephone set according to claim 8, wherein the operation of a received signal mixing portion, a demodulating portion and a base band signal processing portion in the receipt function unit is determined on the basis of the predetermined software.

11. The portable telephone set according to claim 8, wherein one of a plurality of transmission function units each performing a different frequency band operation is detachably mounted to the body.

12. The portable telephone set according to claim 9, wherein the plurality of softwares are stored in a software source memory, one of the plurality of softwares is selected and down-loaded and the operation of the receipt processing unit is defined by the down-loaded software.

13. The portable telephone set according to claim 8, wherein the transmission function unit includes an amplifier, a transmission signal filter and an isolator.

14. The portable telephone set according to claim 8, wherein the transmission function unit includes a

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software memory for storing a plurality of softwares each adapted to each transmission function unit, the predetermined software being defined by loading the software from the software memory in the mounted transmission function unit.

15. The portable telephone set according to claim 8, wherein a currently-operating system is detected on the basis of demodulated output of the received signal in the receipt function unit, and wherein the detected system is displayed.

16. A portable telephone set substantially as herein described with reference to and as shown in the accompanying drawings.

Application No:	GB 0007280.1	Examiner:	Robert Shorthouse
Claims searched:	1-16	Date of search:	28 September 2000

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

    UK Cl (Ed.R): H4L (LEP, LDSC, LECCP, LECCX

      Int Cl (Ed.7): H04Q 7/32

Other: Online: WPI, EPODOC, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	GB 2326309 A (NOKIA) See abstract	-
A	US 5896566 (AVERBUCH ET AL) See abstract	-

An Executive Agency of the Department of Trade and Industry

Docket # *P2001,0329*

Applic. #

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